

8.5 BALTIMORE COUNTY

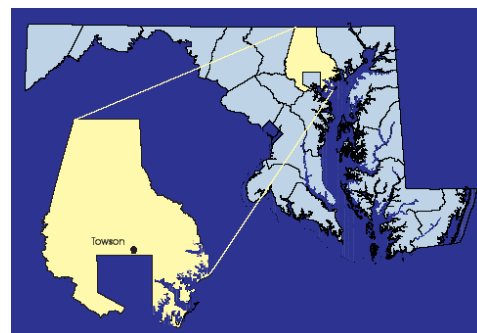
This chapter presents information about stream conditions of potential management interest in Baltimore County based on the 2000-2004 MBSS results. Information from Maryland Biological Stream Survey (MBSS) data collected between 1994 and 1997 can be found in MDNR 2001c.

8.5.1 Ecological Health

Based on the three ecological health indicators used by the MBSS, the overall condition of Baltimore County streams during 2000-2004 was Fair (Figure 8-24). The FIBI results indicate that 25% of the streams in the county were in Good condition, while 37% rated Good using the BIBI. Using the combined indicator (CBI), 49% of the streams in the county scored as Poor or Very Poor, 23% scored as Good, and 28% scored as Fair.

Most of the sites in Baltimore County that were rated as Poor or Very Poor using IBIs were inside the Baltimore Beltway. In contrast, Good sites were most frequent in the upper Gunpowder River area above Loch Raven Reservoir, as well as in the Liberty Reservoir portion of the Patapsco River. The highest rated stream in Baltimore County using the Combined Biotic Index (CBI) was Cooks Branch/Timber Run, while the lowest rated streams included Minebank Run, Cooper Branch and an unnamed tributary to the Patapsco River (Table 8-9). Based on Stream Waders volunteer data, the watersheds in the county that had the largest proportion of sites rated as Poor or Very Poor for benthic macroinvertebrates were Gwynns Falls, Back River, and Baltimore Harbor (Table 8-10). In contrast, Little Gunpowder Falls had the largest number of sites rated Good.

Four MBSS Sentinel sites are located in Baltimore County. These streams included Baisman Run, Timber Run, the North Branch of Jones Falls, and an unnamed

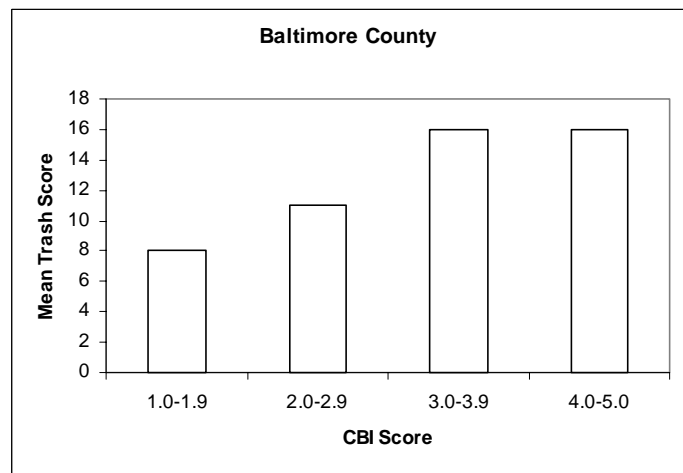


tributary to Dipping Pond Run. Two Sentinel sites had to be dropped from the Sentinel network during 2000-2004, Greene Branch, and Beaverdam Run. Greene Branch was dropped because of clearcutting in the riparian buffer zone. Beaverdam Run was dropped because a housing development was started just upstream. Sentinel sites were chosen to provide a representation of the best remaining streams around the state and track natural variations in stream health. Where possible, Sentinel sites are located in watersheds with as much protected land as possible. More information about the MBSS Sentinel stream network is found in: 2000-2004 Maryland Biological Stream Survey Volume 11: Sentinel Sites (http://www/dnr/Maryland.gov/streams/pubs/ea05-8_sentinel.pdf).

8.5.2 Physical Habitat

8.5.2.1 Overall Condition

Based on the Physical Habitat Index (PHI), only 7% of the streams in Baltimore County had Minimally Degraded habitat, 45% had Partially Degraded habitat, and 48% had Degraded or Severely Degraded habitat (Figure 8-25). The eastern portion of the county had the highest concentration of physically degraded sites. In contrast, the few sites rated as Minimally Degraded for physical habitat were generally located in Liberty Reservoir, upper Gwynns Falls, and upper Prettyboy Reservoir areas.



Baltimore County CBI vs. Trash

TRASH VS CBI

Trash, or human refuse, is common along roadways and streams in Maryland's urban and urbanizing areas. In Baltimore County, there was a strong negative relationship between the amount of trash at a site and its Combined Biotic Index score. Potential reasons for this relationship include illegal dumping and runoff of pollutants from associated impervious areas.

8.5.2.2 Trash

About 50% of the stream miles in Baltimore County were rated Optimal for trash and 36% were rated as being in Marginal or Poor condition (Figure 8-26). Nearly all sites inside the Baltimore Beltway were rated as Poor or Marginal, and no streams were rated as Optimal. Areas outside the Beltway had much lower levels of trash generally, but there were several scattered sites rated as Poor for trash.

8.5.2.3 Channelization

Nearly 22% of the stream miles in Baltimore County had some degree of channelization (Table 8-4). Concrete was the most common type of channelization (11%), followed by rip-rap (7%), gabions, dredged channels, and culvert pipes. Most channelization in the county was found in the southern portion of the county (Figure 8-27).

8.5.2.4 Inadequate Riparian Buffer

Nearly 8% of the stream miles in Baltimore County had no riparian buffers (Table 8-3). In addition, 15% of stream miles had severe breaks in the riparian buffer that were present. Areas with inadequate riparian buffer were scattered in a few locations throughout the county, and unlike many other variables measured, the riparian zone did not appear to be diminished inside the Baltimore Beltway (Figure 8-28). Severe buffer breaks were scattered throughout the county. Additional information about buffer breaks, analyzed by county, is provided in: 2000-2004 Maryland Biological Stream Survey Volume 10: Riparian Zone Conditions (http://www/dnr/Maryland.gov/streams/pubs/ea05-7_riparian.pdf).

8.5.2.5 Eroded Banks/Bedload Movement

Nearly 23% of the stream miles in Baltimore County had severe (Poor) bank erosion, and an additional 14% were rated as Marginal (Figure 8-29). Only about 26% of the streams in the county were rated as Optimal for bank erosion. No strong geographic patterns were evident, although bank erosion appeared less pronounced in the Patapsco and Gwynns Falls watersheds compared to the rest of the county.

An estimated 54% of stream miles in Baltimore County had minor or no formation on instream bars (Figure 8-29). In contrast, nearly 15% of stream miles had extensive bar development. No geographic trend in bar formation was evident in the county.

8.5.3 Key Nutrients

8.5.3.1 Nitrate-Nitrogen

Only 18% of the stream miles in Baltimore County had nitrate-nitrogen levels below the upper bound of levels found in mostly forested (>90%) watersheds (Figure 8-30). However, only about 5% of streams had nitrate-nitrogen levels associated with biological impacts. Most of the streams rated as having nitrate-nitrogen levels comparable to background were in the more populated southern half of Baltimore County. In contrast, sites with low levels of nitrate-nitrogen were primarily along the western edge of the county.

8.5.3.2 Total Phosphorus

An estimated 71% of all stream miles in Baltimore County had total phosphorus levels at or below the upper bound of levels found in streams within forested (>90%) watersheds in Maryland (Figure 8-31). In contrast, 6% of streams had total phosphorus levels above those associated with biological impacts. Elevated levels of total phosphorus occurred primarily in the center of the county, and most of the streams with high levels of total phosphorus were located near the Carroll County border.

8.5.4 Stream and River Biodiversity

To provide a means to prioritize stream systems for biodiversity protection and restoration within each county and on a statewide basis, a tiered watershed and stream reach prioritization method was developed. Special emphasis was placed on state-listed species, stronghold watersheds for state-listed species, and stream reaches with one or more state-listed aquatic fauna. Fauna considered included stream salamanders, freshwater fishes, and freshwater mussels. Rare, pollution-sensitive benthic macroinvertebrates collected during the 1994-2004 MBSS were also used to identify the suite of watersheds necessary to conserve the full array of known stream and river biota in Maryland. A complete description of the biodiversity ranking process is found in: 2000-2004 Maryland Biological Stream Survey Volume 9: Stream and Riverine Biodiversity (http://www/dnr/Maryland.gov/streams/pubs/ea05-6_biodiv.pdf).

Of the 10 watersheds found in Baltimore County, the highest rated for stream and river biodiversity was Deer Creek, a Tier 1 watershed that was a stronghold for one or more state-listed species and one of the top three watersheds in the state (Figure 8-32). The only Tier 2 watershed (Stronghold for non-state listed species of Greatest Conservation Need (GCN)) was Prettyboy Reservoir. In contrast, the Back River watershed was the lowest ranking for stream and river biodiversity in Baltimore County and nearly in the state (80th of 84). Reaches that had either state-listed species or high intactness values were highlighted to facilitate additional emphasis in planning restoration and protection activities.

8.5.5 Stressors

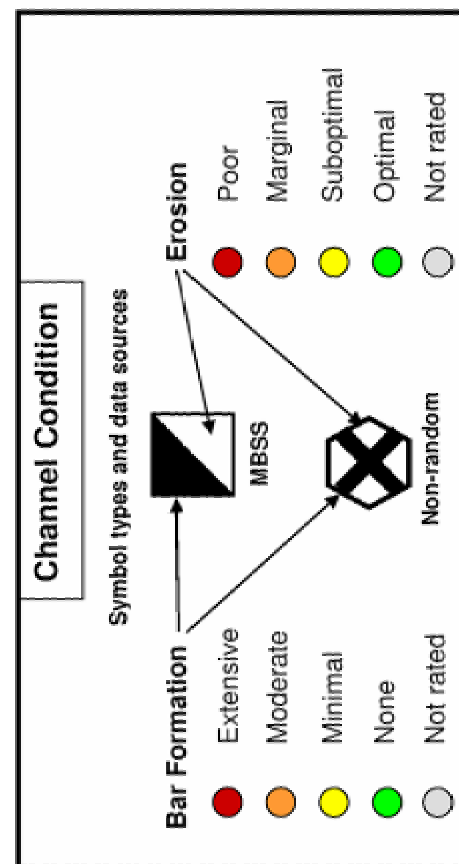
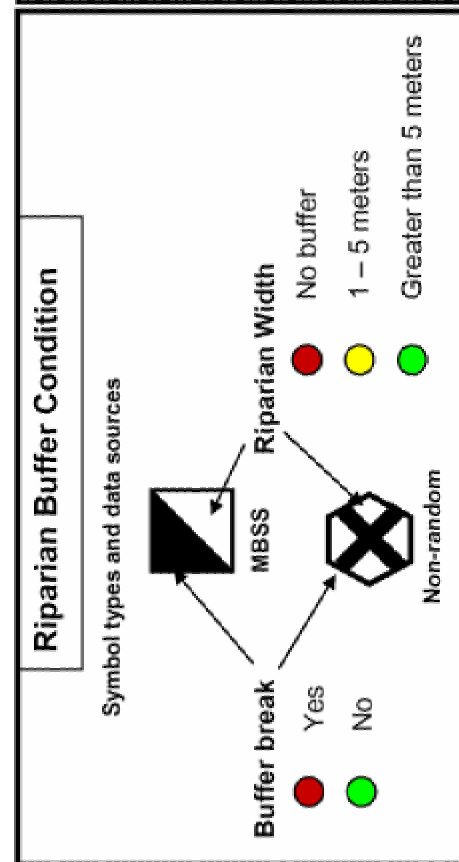
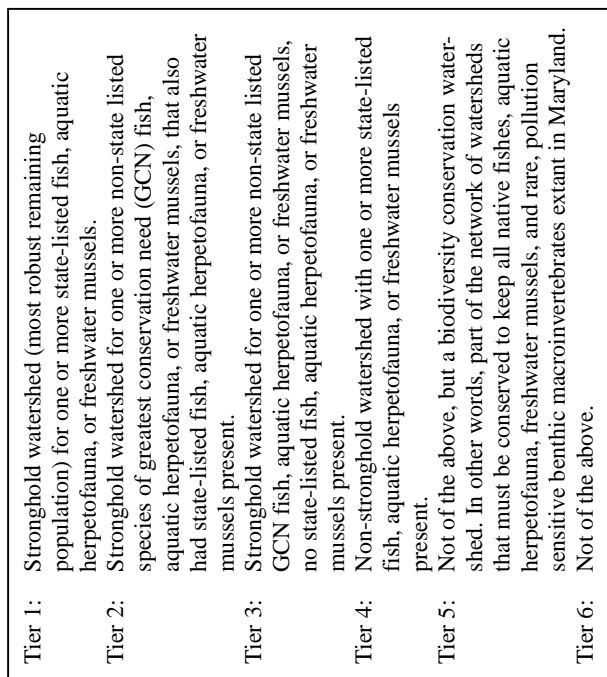
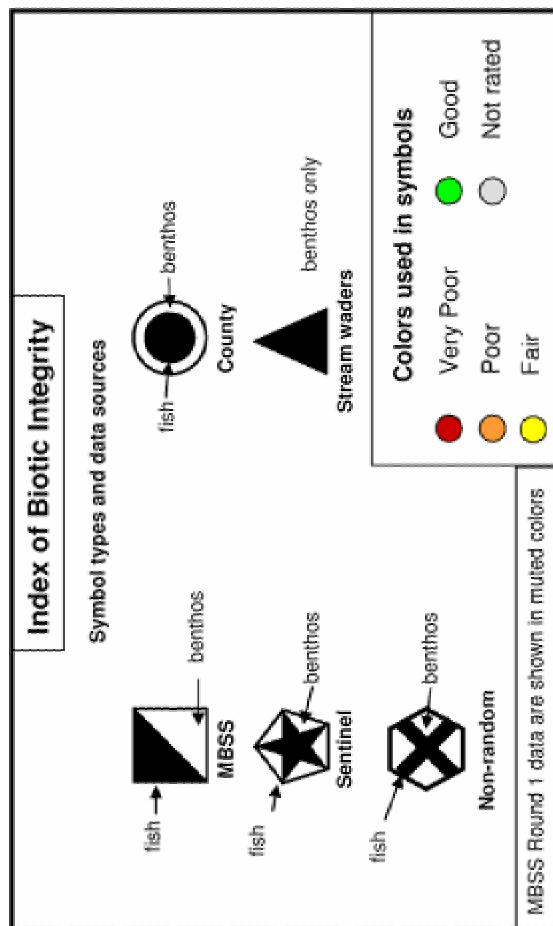
The most extensive stressor characterized by the MBSS in Baltimore County during the 2000 – 2004 MBSS was non-native terrestrial plants in riparian areas (100% of stream miles; Figure 8-5). At 43% of stream miles, the second greatest stressor was non-native aquatic fauna. Other stressors found extensively were: streams with eroded banks (40% of stream miles); watershed >5% urban land use (39% of stream miles); areas with no riparian buffer (8% of stream miles). More than 5% of the stream miles in the county were also affected by nitrate-nitrogen levels considered deleterious to some aquatic fish, amphibians, and benthic macroinvertebrates.

AN IMPORTANT NOTE ON BIODIVERSITY MANAGEMENT

Perhaps the largest ongoing natural resources restoration and protection effort in Maryland is associated with the Chesapeake Bay. In most cases, freshwater biodiversity is not specifically considered during placement and prioritization of Bay restoration and protection projects. In this report and in the more detailed volume in the series on aquatic biodiversity, a system of biodiversity ranking is presented to provide counties and other stewards with a means to plan appropriate protection and restoration activities in locations where they would most benefit stream and river species. Given the historically low level of funding for biodiversity protection and restoration in Maryland and elsewhere, the potential benefit of incorporating freshwater biodiversity needs into other efforts is quite large.

However, it is important to note that although freshwater taxa are the most imperiled group of organisms in Maryland, other groups and individual species not typically found in freshwater habitats are also at high risk and constitute high priority targets for conservation. In addition, freshwater taxa that prefer habitats such as small wetlands may not be well-characterized by the ranking system employed here. To conserve the full array of Maryland's flora and fauna, it is clearly necessary to use other, landscape-based tools and consider factors such as maintaining or reconnecting terrestrial travel corridors.

Key to MBSS 2000-2004 County Maps



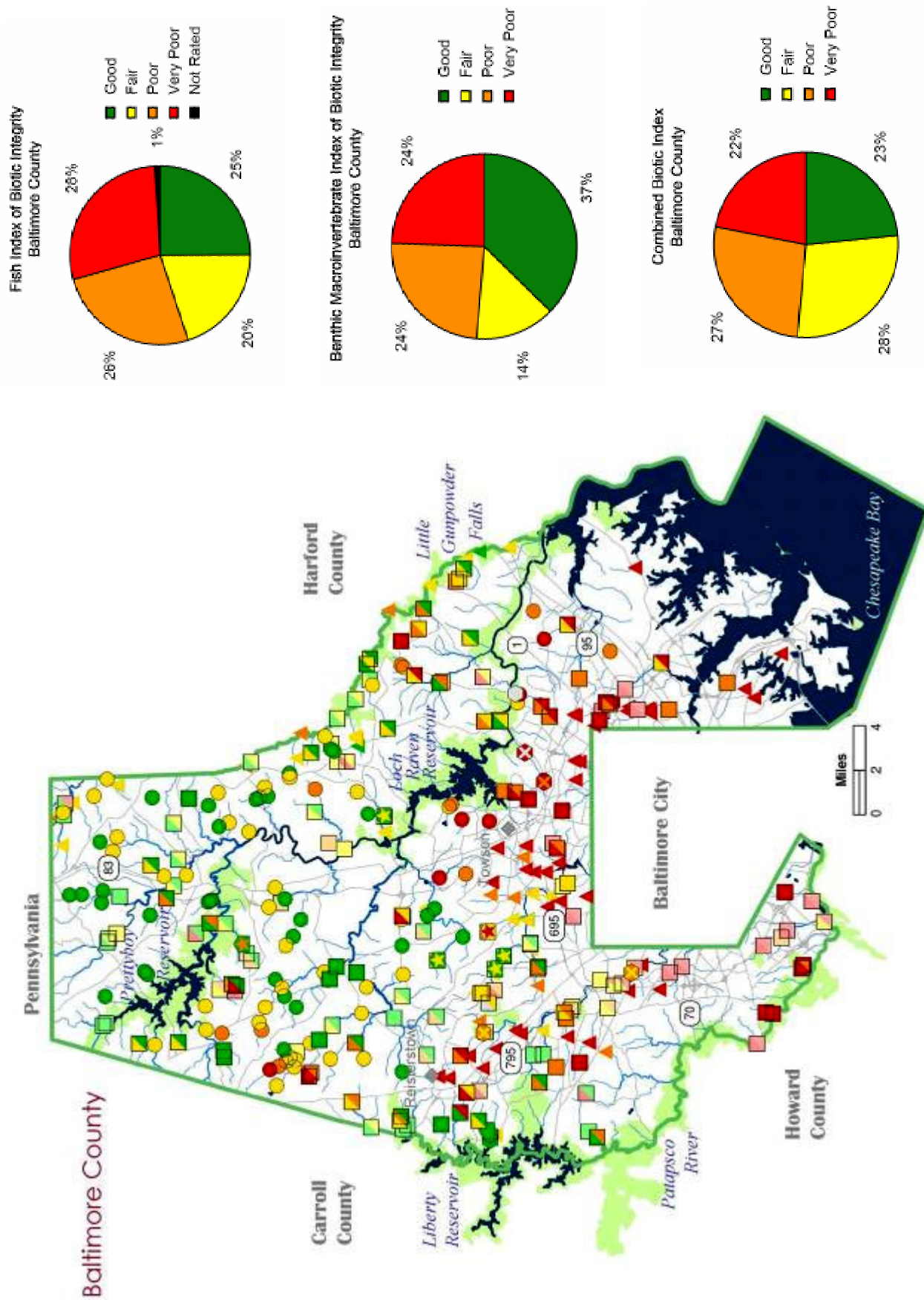


Figure 8-24. Benthic Index of Biotic Integrity (BIBI) and Fish Index of Biotic Integrity (FIBI) pie charts and map of stream health for Baltimore County streams sampled by the MBSS during 1995-97 and 2000-2004 (pie chart represents 2000-2004 data only, Combined Biotic Index pie chart represents mean of FIBI and BIBI).

Table 8-9. MBSS sites sampled in Baltimore County during 1994- 2004, ranked by Combined Biotic Index Score (CBI)

Baltimore County - MBSS Sites			
SITE NUMBER	STREAM NAME	WATERSHED	CBI
<i>Best (in order of CBI score)</i>			
LIBE-204-C-2001	Cookes Branch	Liberty Reservoir	5.00
LIBE-102-C-2000	Timber Run	Liberty Reservoir	5.00
LIBE-103-C-2001	Cookes Branch	Liberty Reservoir	4.83
LIBE-204-C-2000	Cookes Branch	Liberty Reservoir	4.83
LIBE-101-C-2000	Timber Run	Liberty Reservoir	4.83
LIBE-102-S-2001	Timber Run	Liberty Reservoir	4.83
PRET-110-R-2000	Peggy's Run UT1	Prettyboy Reservoir	4.83
LIBE-103-C-2000	Cookes Branch	Liberty Reservoir	4.67
LIBE-102-S-2004	Timber Run	Liberty Reservoir	4.67
BA-P-008-101-95	North Branch Patapsco River UT	Liberty Reservoir	4.67
BA-P-206-108-95	North Branch Patapsco River UT	Liberty Reservoir	4.67
LIBE-102-S-2002	Timber Run	Liberty Reservoir	4.67
BA-P-333-303-96	Beetree Run	Loch Raven Reservoir	4.67
BA-P-313-215-95	Red Run	Gwynns Falls	4.50
BA-P-077-315-96	North Branch Jones Falls	Jones Falls	4.50
JONE-315-S-2000	North Branch Jones Falls	Jones Falls	4.50
JONE-315-S-2002	North Branch Jones Falls	Jones Falls	4.50
LIBE-101-R-2000	Keysers Run	Liberty Reservoir	4.50
BA-P-291-217-95	Falls Run	Patapsco River Lower North	4.50
PRET-214-R-2000	Peggy's Run	Prettyboy Reservoir	4.50
PRET-104-R-2000	Poplar Run	Prettyboy Reservoir	4.33
LIBE-117-R-2000	Liberty Reservoir UT1	Liberty Reservoir	4.33
LOCH-121-R-2002	First Mine Branch	Loch Raven Reservoir	4.33
BA-P-379-315-96	Gunpowder Falls	Prettyboy Reservoir	4.33
BA-P-238-311-96	Little Falls	Loch Raven Reservoir	4.33
<i>Worst (most degraded sites first)</i>			
LOGU-285-M-2003	Minebank Run	Lower Gunpowder Falls	1.00
BA-P-415-119-95	Cooper Branch	Patapsco River Lower North	1.00
BA-N-057-113-96	Patapsco River UT	Patapsco River Lower North	1.00
BA-P-013-328-96	Dead Run	Gwynns Falls	1.17
BA-P-262-111-96	Gwynns Falls UT	Gwynns Falls	1.17
BA-P-269-214-96	Moore's Branch	Jones Falls	1.17
BA-P-074-106-96	UN Trib to Towson Run	Jones Falls	1.17
LIBE-102-X-2004	Longwell Branch	Liberty Reservoir	1.17
LOCH-115-R-2002	Long Quarter Branch UT	Loch Raven Reservoir	1.17
PATL-127-R-2000	Patapsco River UT1	Patapsco River Lower North	1.17
PATL-119-R-2000	Soapstone Branch	Patapsco River Lower North	1.17
BA-P-464-117-95	West Branch Herbert Run UT	Patapsco River Lower North	1.17
LIBE-101-X-2004	Longwell Branch	Liberty Reservoir	1.33
LIBE-103-X-2004	Longwell Branch	Liberty Reservoir	1.33
BACK-101-R-2002	Herring Run UT	Back River	1.33
BACK-113-R-2002	Stemmers Run	Back River	1.33
LIGU-113-R-2003	Little Gunpowder Falls UT 5	Little Gunpowder Falls	1.33
PATL-105-R-2000	Patapsco River UT2	Patapsco River Lower North	1.50
BA-N-047-128-96	Redhouse Run	Back River	1.50
LIBE-103-X-2002	Longwell Branch	Liberty Reservoir	1.50
LOCH-102-R-2002	Loch Raven Reservoir UT	Loch Raven Reservoir	1.50
BACK-110-R-2002	Stemmers Run	Back River	1.50
BA-N-001-211-96	Stemmers Run	Back River	1.50
LIBE-102-X-2002	Longwell Branch	Liberty Reservoir	1.50
LOGU-190-M-2003	Minebank Run	Lower Gunpowder Falls	1.50

The Baltimore County Department of Environmental Protection and Resource Management collects stream-related data at various sites throughout the county. Two major river basins, the Patapsco River/Back River Basin and the Gunpowder Falls/Deer Creek Basin, are sampled in alternate years. A probability-based sampling design is used for county monitoring, and sampling methods mimic Maryland Biological Stream Survey (MBSS) protocols for benthic macroinvertebrates and physical habitat, with several MBSS habitat measurements omitted (Kazyak 2001). One-hundred randomly selected sites are sampled every year. *In situ* water quality data are collected at each of the sites using a YSI multi-parameter water quality probe. In previous years, Baltimore County utilized the EPA's Rapid Bioassessment Protocols (RPB) (Barbour et al. 1999) for habitat assessment, but beginning in 2003, methods were switched to follow MBSS Summer Habitat Assessment protocols.

In addition to probabilistic benthic monitoring, Baltimore County also samples for fish and benthic macroinvertebrates at targeted sites in the county. By combining this targeted data with the probabilistic data, the county will be able to better assess the health of the biological communities in Baltimore County streams. This data will also be used to prioritize stream restoration projects.

To better estimate stream condition in the County, MBSS data were integrated with Baltimore County data to arrive at a combined estimate of stream condition using the benthic macroinvertebrate IBI (Southernland et al. 2005). The scores from approximately 98 County sites were combined with scores from 116 random MBSS sites. Results are shown in the following table. Note that while the overall score changed little, the standard error decreased when the data from the programs are combined; thus increasing the precision of the estimate. This increased precision allows for a more accurate assessment of overall stream health in Baltimore County. In the future, the MBSS and the County will continue to coordinate sampling in ways that balance monitoring effort and desired precision of stream condition estimates.

Sampling Program	Mean Benthic IBI	Standard Error	Condition Class
MBSS Alone	3.06	0.15	Fair
Baltimore County Alone	3.24	0.19	Fair
Combined	3.04	0.085	Fair

Table 8-10.

Stream Waders sites sampled in Baltimore County during 2000-2004, ranked by Family-level Benthic Index of Biotic Integrity

Baltimore County - Stream Wader Sites				
WATERSHED	# GOOD	# FAIR	# POOR	# VERY POOR
Back River	0	0	0	15
Baltimore Harbor	0	0	0	4
Bird River	0	0	0	2
Deer Creek	2	4	1	0
Gunpowder River	0	0	0	1
Gwynns Falls	0	1	1	9
Jones Falls	1	10	5	15
Liberty Reservoir	2	3	2	0
Little Gunpowder Falls	5	6	3	0
Loch Raven Reservoir	1	1	0	0
Patapsco River L N Br	0	0	1	2
Prettyboy Reservoir	2	5	0	1

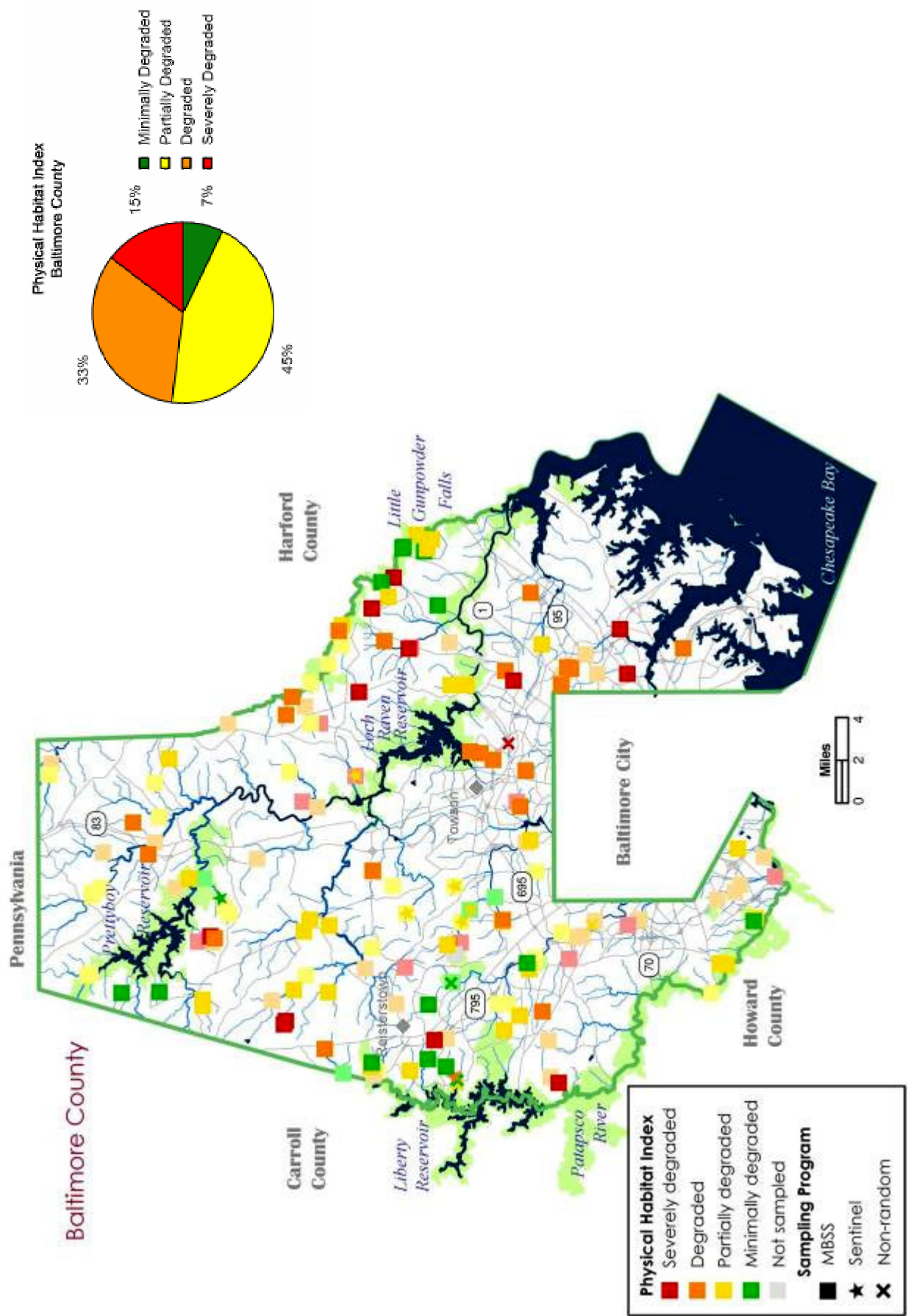


Figure 8-25. Physical Habitat Index (PHI) pie chart and map of stream habitat quality for Baltimore County streams sampled by the MBSS during 1995-97 and 2000-2004 (pie chart represents 2000-2004 data only).

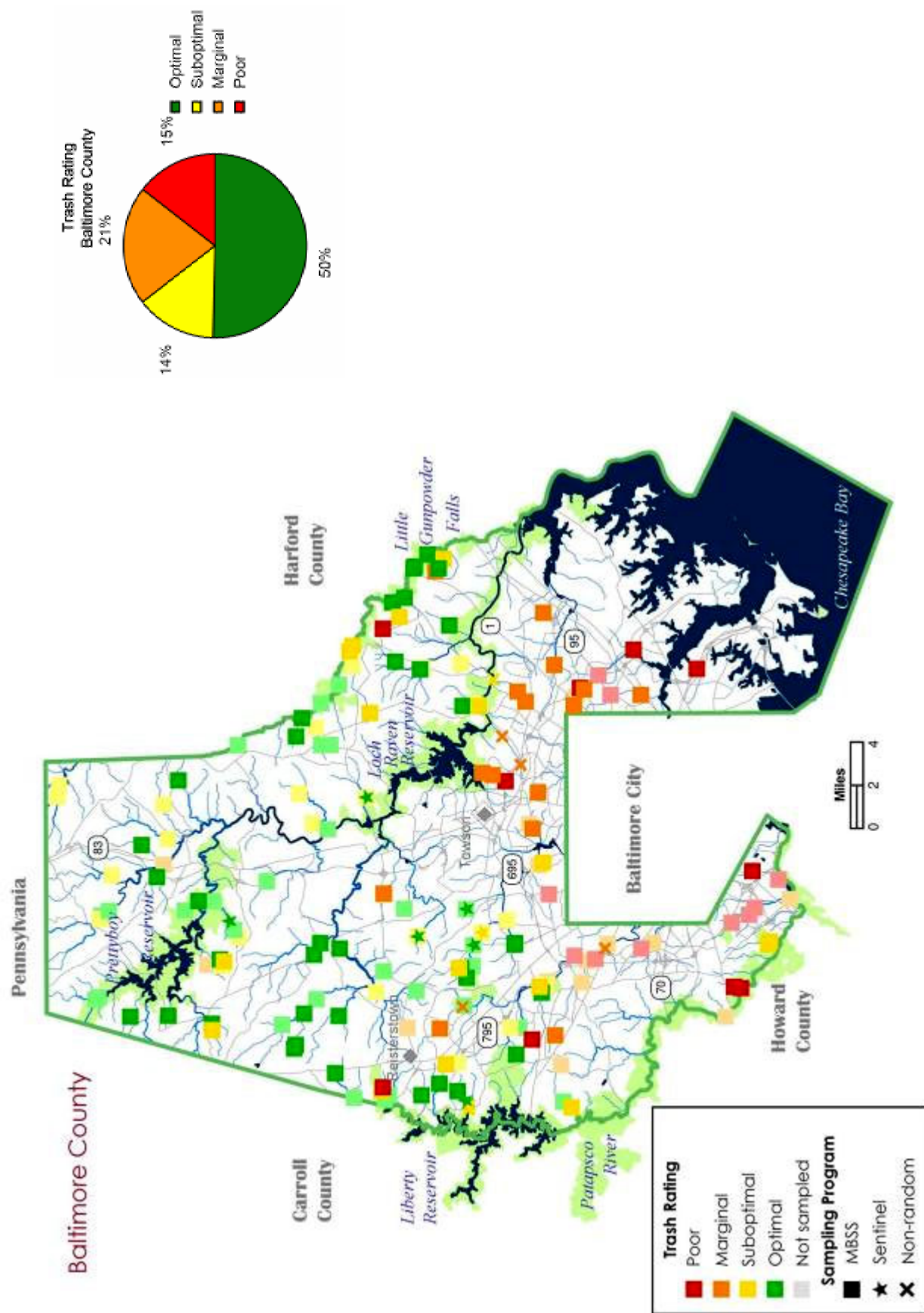


Figure 8-26. Pie chart and map of trash rating (0-20 scale) for Baltimore County streams sampled by the MBSS during 1995-97 and 2000-2004 (pie chart represents 2000-2004 data only)

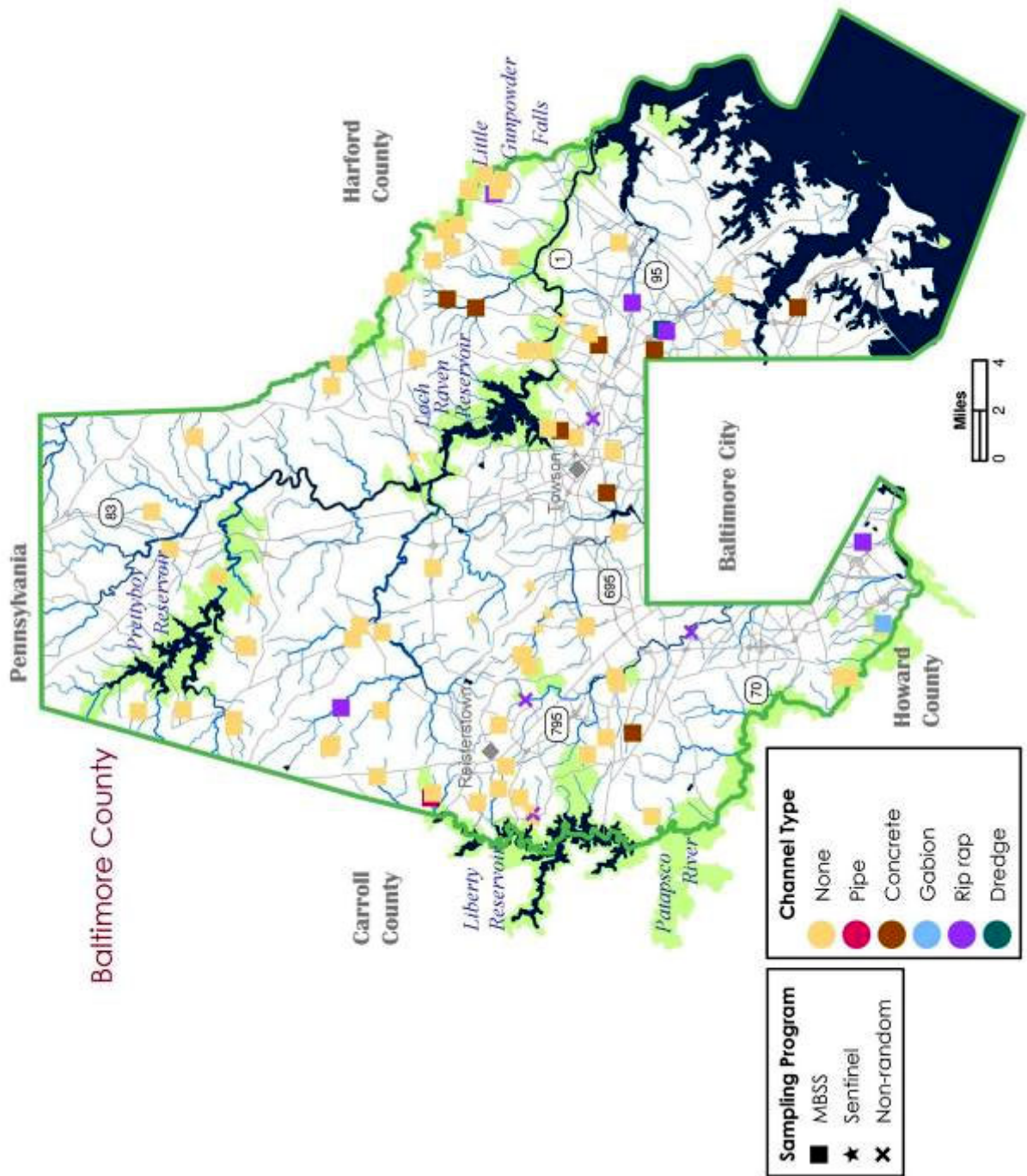


Figure 8-27. Map of channelized sites, by type, for Baltimore County streams sampled by the MBSS during 2000-2004. NOTE: When channelization is indicated, it does not necessarily mean that the entire 75m segment was affected.

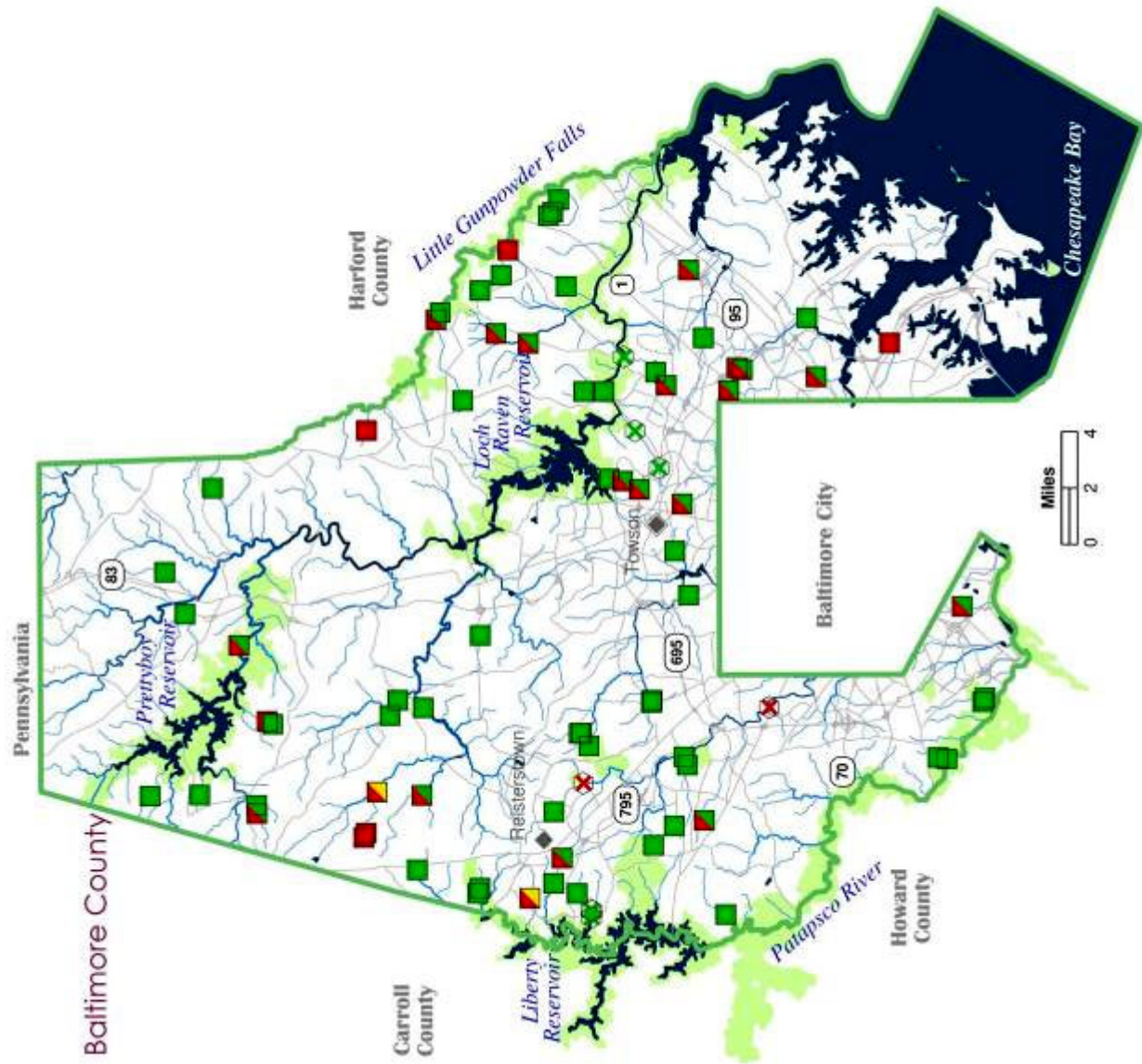


Figure 8-28. Map of sites with inadequate riparian buffers and buffer breaks for Baltimore County streams sampled by the MBSS during 2000-2004. *NOTE: Multiple riparian buffer breaks sometimes occurred at a site; only the most severe was depicted.*

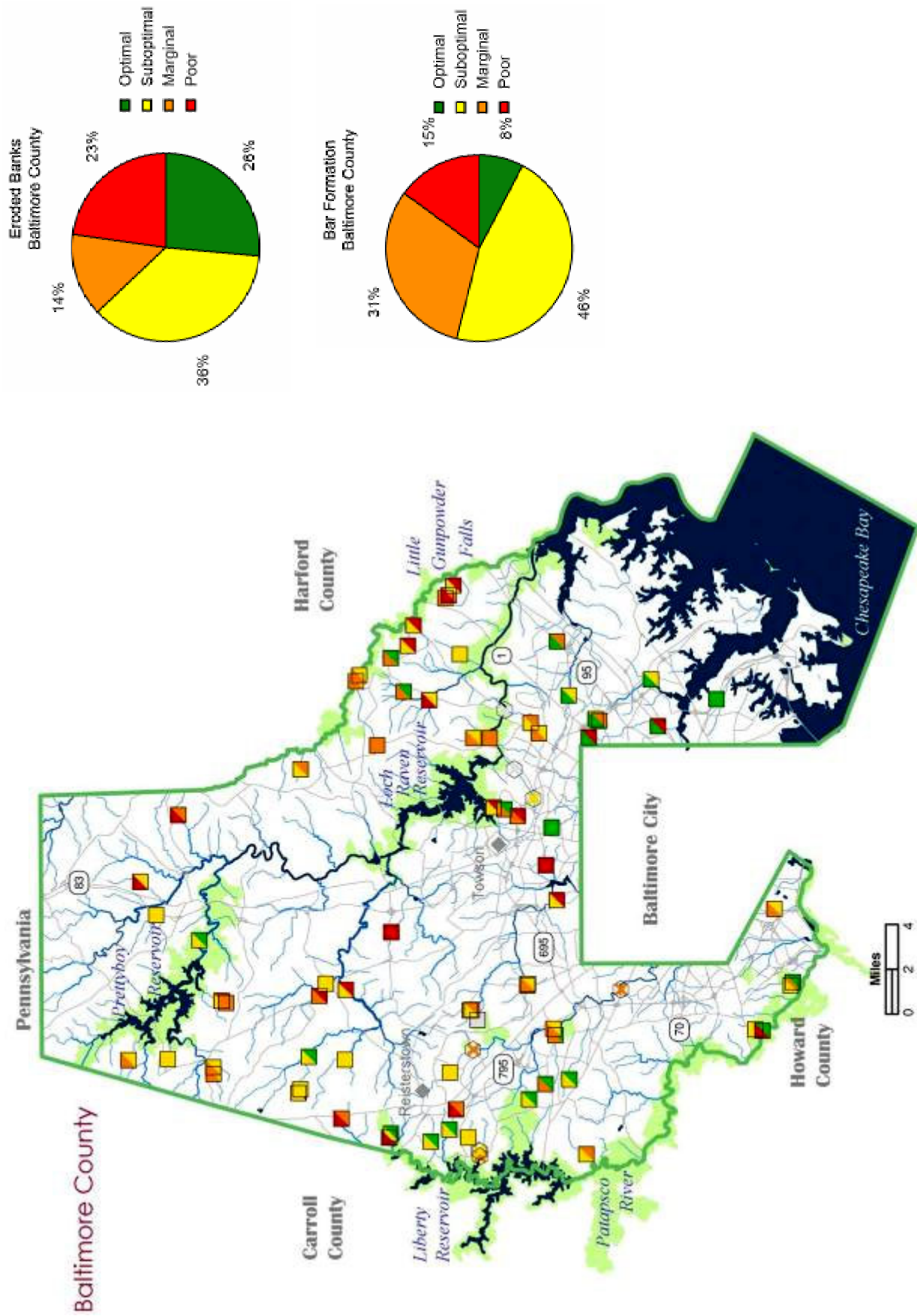


Figure 8-29. Pie charts and map of sites with eroded banks and instream bar formation for Baltimore County streams sampled by the MBSS during 2000-2004

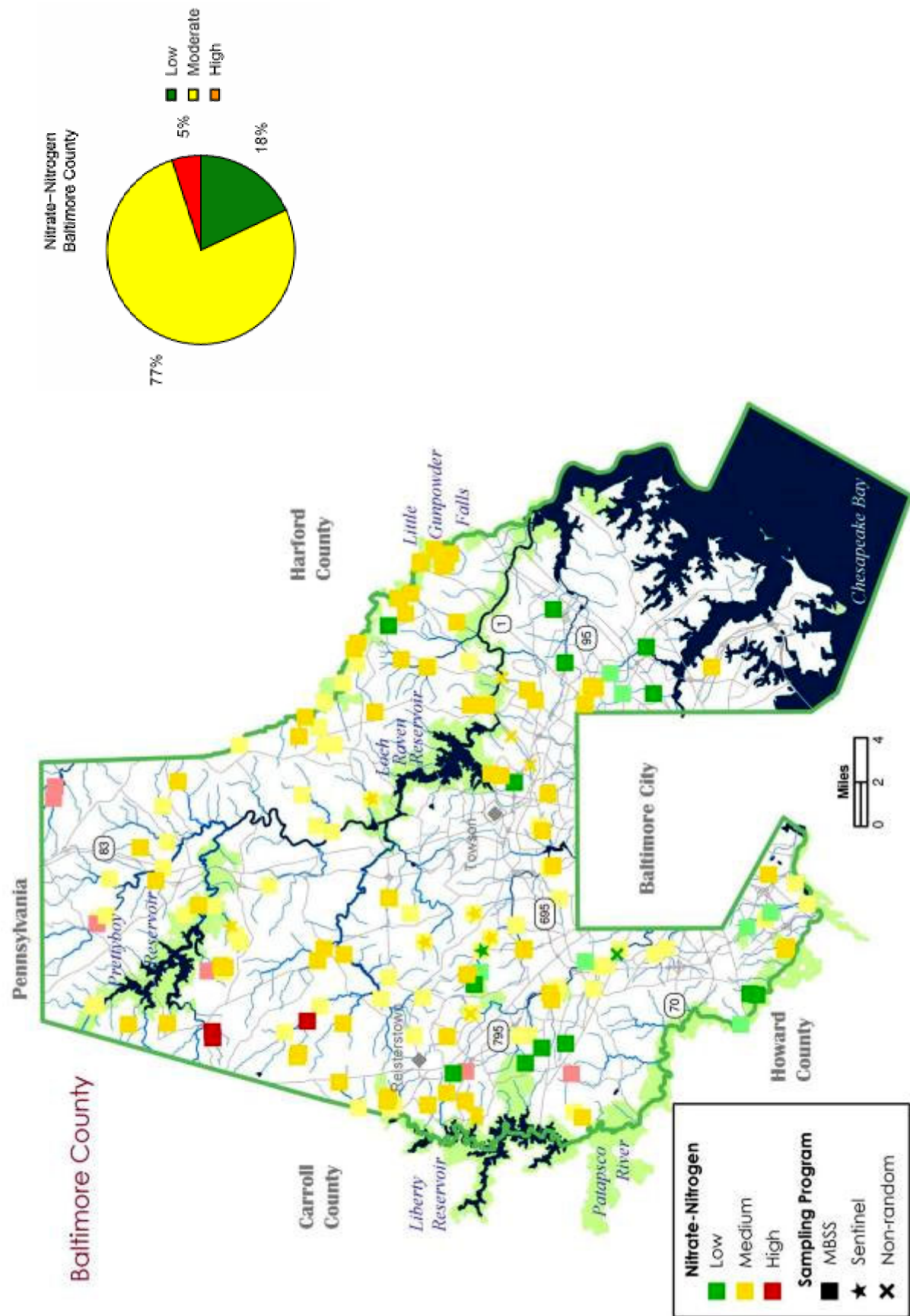


Figure 8-30. Pie chart and map of nitrate-nitrogen values (mg/l) for Baltimore County streams sampled by the MBSS during 1995-97 and 2000-2004 (pie chart represents 2000-2004 data only). (Low = < 1.0, Medium = 1.0 – 5.0, and High = > 5.0)

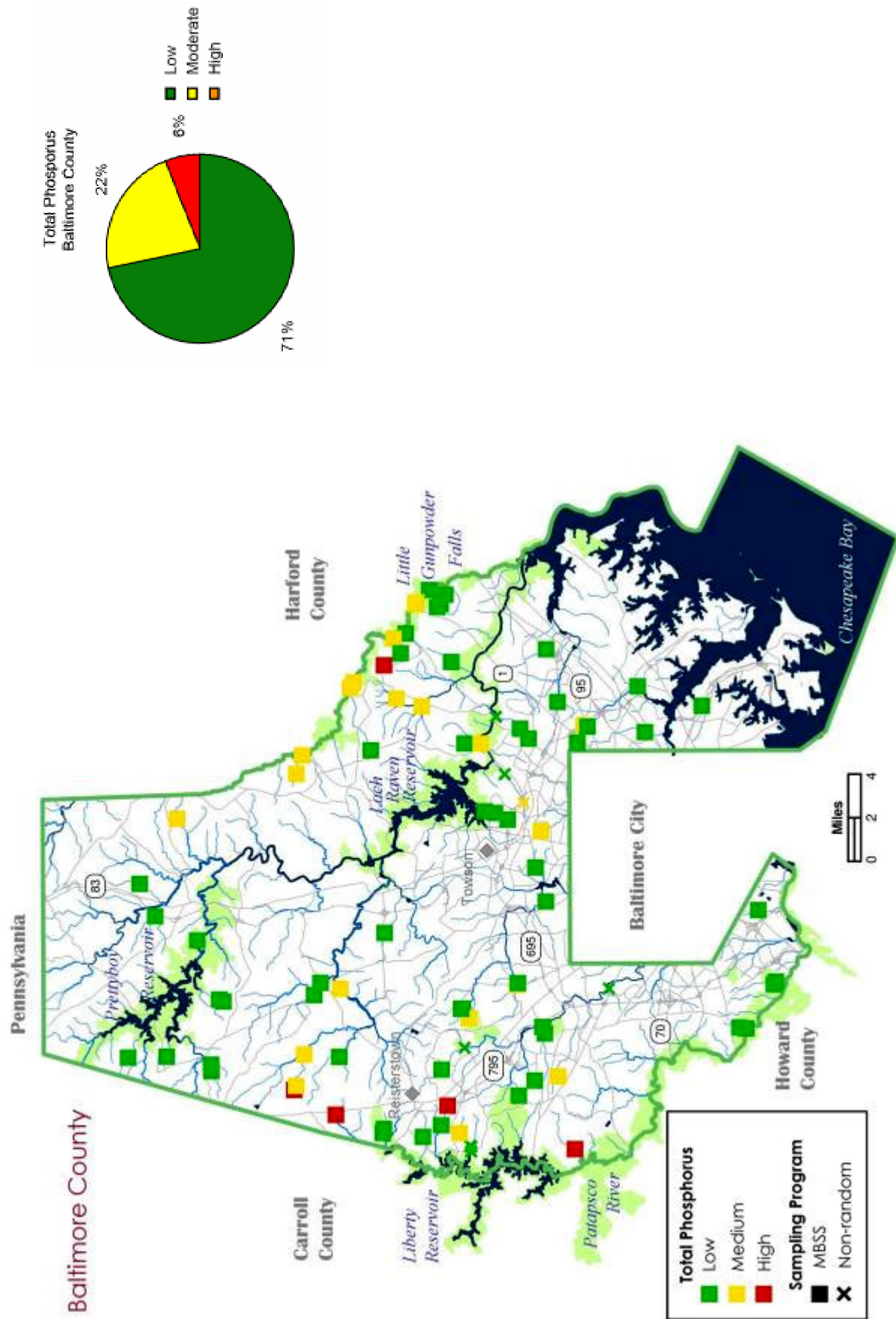


Figure 8-31. Pie chart and map of total phosphorus values (mg/l) for Baltimore County streams sampled by the MBSS during 2000-2004. (Low = < 0.025, Medium = 0.025 – 0.07, High = > 0.07)

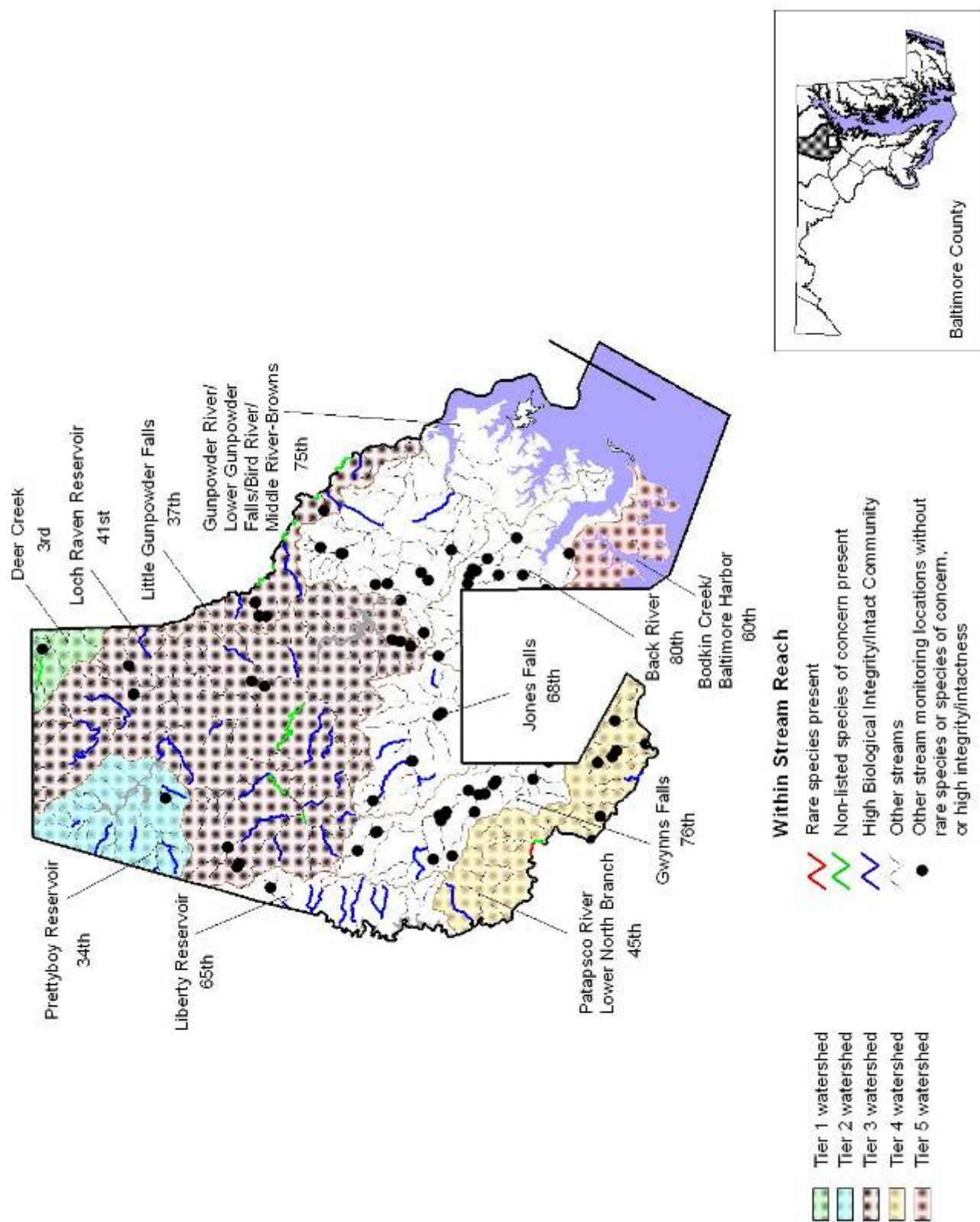


Figure 8-32. Aquatic Heritage Biodiversity Ranking map for Baltimore County, by watershed. Data from MBSS 1994-2004, MBSS qualitative data, Raesly, unpub. data, Harris 1975, Thompson 1984, and DNR Natural Heritage Program database.

